Claims

What is claimed is:

1. A method for analyzing properties of a sample by measuring fluorescence parameters in multiple foci, said process comprising the steps of:

splitting a collimated primary laser beam with a splitting device into at least two collimated secondary laser beams and deflecting the secondary laser beams such that the secondary laser beams propagate at different propagation angles with respect to an optical axis of a focusing optic;

focusing the secondary laser beams with the focusing optic into at least two volume elements in the sample;

detecting light emitted from the volume elements with a detecting device; and

evaluating the detected light for obtaining the properties to be analyzed.

2. The method according to claim 1, wherein the at least two secondary laser beams have identical intensities, peak intensities and/or beam profiles at a plurality of wavelengths.

3. The method according to claim 1, wherein the splitting step comprises a broadening of the primary laser beam to provide a broadened primary laser and directing the broadened primary laser onto a mirror array reflecting the secondary laser beams.

4. The method according to claim 3, wherein the primary laser beam is subjected to a profile shaping by a neutral density filter or a diffractive beam shaper.

5. The method according to claim 1, wherein the splitting step comprises generating the secondary laser beams with at least one prism.

6. The method according to claim 5, wherein the secondary laser beams are generated with at least one Wollaston prism.

7. The method according to claim 6, wherein the secondary laser beams are directed from the at least one Wollaston prism to the focusing optic via a mirror array.

8. The method according to claim 7, wherein mirrors of the mirror array are selectively tilted for adjusting the propagation angles of the secondary laser beams.

9. The method according to claim 1, wherein the primary laser beam is generated with an intensity and wavelength suitable for multi-photon excitation of the sample and the focusing step comprises a multi-photon excitation of the sample in the at least two volume elements.

10. The method according to claim 1, wherein the focusing optic is a confocal focusing optic and the detecting step comprises projecting the at least two volume elements with the focusing optic and a beam splitter on corresponding detector units of the detecting device.

11. The method according to claim 1, wherein the detecting and evaluating steps comprise transforming a flow of detected photons in the detecting device into a signal stream over time and/or converting and/or combining the signals collected from the volume elements at different time points and from different detection units into information about the sample.

12. A device for performing the method of claim 1, said device comprising:

a source for generating a collimated primary laser beam;

a splitting device for splitting the primary laser beam into at least two secondary laser beams, wherein the splitting device contains plane refractive or reflective surfaces arranged for forming the secondary laser beams as collimated laser beams, and each of the collimated laser beams has a different propagation angle with respect to an optical axis of a focusing optic;

the focusing optic for focusing the secondary laser beams into at least two volume elements in the sample; and

a detecting device for detecting light emitted from the volume elements and for evaluating the detected light in order to obtain the at least one property to be analyzed.

13. The device according to claim 12, wherein the splitting device comprises a mirror array having at least two mirrors forming the reflecting surfaces.

14. The device according to claim 13, further comprising a profile shaping device adapted for profile shaping of the primary laser beam.

15. The device according to claim 14, wherein the profile shaping device comprises a neutral density filter or a diffraction beam shaper.

16. The device according to claim 12, wherein the splitting device comprises at least one prism containing the refracting surfaces.

17. The device according to claim 16, wherein the at least one prism comprises at least one Wollaston prism.

18. The device according to claim 16, wherein a mirror array comprising at least two mirrors is arranged between the at least one prism and the focusing optics.

19. The device according to claim 13, wherein the mirrors of the mirror array are movable for adjusting the propagation angles of the secondary laser beams.

20. The method of claim 1, further comprising:

parallel analyzing a plurality of samples;

high-throughput screening a plurality of samples;

obtaining time-resolved end or spatial-resolved fluorescence spectroscopic measurements;

conducting fluorescence correlation spectroscopy;

obtaining fluorescence coincidence measurements; and/or

obtaining fluorescence fluctuation measurements.